

TAXONOMY OF *DEUTZIA* (HYDRANGEACEAE) FROM SICHUAN, CHINA

Ping He

Department of Biology, Southwest China Teachers University, Beibei,
Chongqing, P. R. China

ABSTRACT

The present paper deals with a taxonomic study of the genus *Deutzia* Thunb. of Sichuan, China. Eighteen species, and an additional seven varieties are reported. A discussion of economic value, distribution, and a systematic key to species of *Deutzia* are provided. The delimitation and rank of some doubtful taxa, such as *D. corymbiflora* Lem. ex André, *D. vilmorinae* Lem. & Bois, and *D. longifolia* Franch. var. *sikangensis* (Fang) P. He are reinvestigated and ascertained.

KEY WORDS: *Deutzia*, Hydrangeaceae, taxonomy, Sichuan, China

I. Taxonomic history and economic value

Deutzia Thunb. was established by C.P. Thunberg (1781) with the type species *Deutzia scabra* Thunb. of Japan. The genus was named after his good friend, Dutch botanist J. von der Deutz. Afterwards, many western botanists, such as R. Franchet (1885), A. Engler (1891; 1930), C.K. Schneider (1904) and A. Rehder (1911; 1912), have contributed more or less towards a classification of the genus. However, the classification put forward by them was far from satisfactory until the publication of a monograph of *Deutzia* by the Russian botanist T.I. Zaikonnikova (1966). Chinese taxonomists involved with the taxonomy of *Deutzia*, W.C. Cheng (1935), W.P. Fang (1955) and W.T. Wang (1983) have reported five new species of *Deutzia* in China, but no comprehensive systematic work was done on the genus by Chinese scholars. Since the modern distributional center of *Deutzia* is in southwest China (Sichuan and Yunnan), and more and more collections of *Deutzia* reveal limitations of Zaikonnikova's monograph, an overall classification of *Deutzia* in Sichuan seems to be necessary. The author has been engaged in the Saxifragaceae

project for *Flora Sichuanica* and at least 2000 specimens of *Deutzia* kept in all herbaria in Sichuan and some of Yunnan have been painstakingly checked and determined since 1983. Hence, the taxonomic outline presented here is a summary of work on *Deutzia* in Sichuan, China. Descriptions and typifications of recent names occurring in the key are found in papers by P. He (1990) and P. He & L.C. Hu (1990).

The main economic value of *Deutzia* lies in its horticultural use as early spring flowering plants in the North Temperate Zone. Though C.P. Thunberg established the genus as early as 1781, *Deutzia* had not been noticed and introduced into Europe until 1822. It became attractive to Europeans at the end of the last century because many species were introduced into Europe from China, especially from southwest China (Sichuan, Guizhou, and Yunnan) and central China (Hubei), areas rich in *Deutzia* species. Many hybrids with colorful flowers were produced by Victor Lemoine in his famous greenhouse. Recently, disagreements about the horticultural uses of *Deutzia* arose because it lacks colorful flowers and fruits. But *Deutzia* is still attractive to gardeners because of its ease of hybridization and cultivation. In Sichuan, the most popular early spring flowering horticultural *Deutzia* taxon is *D. scabra* Thunb. f. *plena* (Maxim.) C.K. Schn., a white flowered form which can be seen easily in many cities of Sichuan. Another popular one is *D. corymbiflora* Lem. ex André which is widely planted in eastern Sichuan.

Little attention has been paid to the medical uses of *Deutzia*. Only three species from China have been noted to have medical uses. *Deutzia glomeruliflora* Franch. (called mountain jasmine in western Sichuan) and *D. schneideriana* Rehd. (in eastern Sichuan and Hubei) are used to cure enuresis. *Deutzia ningponensis* Rehd. (in Zhejiang) is used to cure enuresis, malaria, scabies, and fracture.

II. Geographical distribution

In the world, there are about 60 species of *Deutzia*. These are grouped into three sections, namely, sect. *Neodeutzia* Engl., sect. *Mesodeutzia* C.K. Schn., and sect. *Deutzia*. About 50 species occur in China, of which ca. 18 species have been known in Sichuan. The distribution of *Deutzia* falls into the Asia-North America disjunction distribution pattern. The majority of species are in sect. *Deutzia* and sect. *Mesodeutzia*, which are restricted to Asia (rarely to eastern Europe) ranging from mainland China to Pakistan, Nepal, India, Bhutan, Japan, Korea, The Philippines, and Soviet Union. A small number of *Deutzia* (sect. *Neodeutzia*) are found in North America (México).

In China, *Deutzia* has been recorded in all the provinces and autonomous regions except Xinjiang. The distributional center is Sichuan and Yunnan,

from which it extends westward to Xizhang (Tibet), eastward to coastal regions of east and southeast China, and northward to Gansu, Shaanxi and north China, some species extend to northeast China.

In Sichuan, *Deutzia* is widely distributed from Wushan, Wuxi in the east, to Baoxing (Muping) and Xiangcheng in the west, and from Huidong, Pangzhihua in the south, to Nanping and Songpan in the north (ca. 26° 20' - 32° 45' N and 98° 50' - 109° 48' E is its main distributional area in Sichuan).

The distribution of sect. *Deutzia* in Sichuan shows an interesting tendency: subsect. *Cymosae* Rehd. has a more easterly distribution, and its elevational distribution tends toward low mountain valleys and moist forest habitats (from alt. 400-1800 m), while subsect. *Stenosepalae* C.K. Schn. has a more westerly distribution, and prefers high mountain cold and dry habitats (from alt. 1800-3500 m). This phenomenon may be mainly due to the special topography of Sichuan and the influence of different ecological factors. The eastern Sichuan basin is humid in summer and warm in winter (temperature in winter is 3-8° C higher than in middle and lower parts of the Yangzhi River). The low terrain of eastern Sichuan, and the northern protective screen of Mt. Qingling and Mt. Daba which can prevent invasion of cold weather from the north, are the probable causes for the higher temperatures in that part of the province. Roughly the same situation occurs in Xichang and the Anling River areas of western Sichuan, where there are many valleys with low elevation and warmer and more humid habitats. *Deutzia* in those areas are mainly the following species, namely, *D. multiradiata* W.T. Wang, *D. nitidula* W.T. Wang, *D. bodinieri* Rehd., *D. fargesii* Franch., *D. leiboensis* P. He & L.C. Hu, *D. pilosa* Rehd., *D. setchuenensis*, and *D. corymbiflora*, which belong to subsect. *Cymosae* Rehd. While in most parts of western Sichuan the climate is more complicated because rugged and high terrain make the habitats here colder and more arid. The plants here are mainly those of subsect. *Stenosepalae* C.K. Schn., including *D. rehderiana* C.K. Schn., *D. discolor* Hemsley, *D. jinyangensis* P. He & L.C. Hu, *D. longifolia* Franch., and *D. glomeruliflora*. From a morphological point of view, *Deutzia* species show very interesting adaptations to different habitats. The majority of *Deutzia* have stellate hairs covering lower and upper sides of leaves. The number of rays and density of stellate hairs vary greatly among species. Those of subsect. *Cymosae* live in warmer and more humid habitats, and therefore are rather sparsely covered with stellate hairs not touching each other and having few (5-8) rays (except *D. multiradiata* and *D. nitidula*), while those of subsect. *Stenosepalae* occupy colder and more arid habitats and are densely to very densely covered with many (10-18) rayed stellate hairs. The dense covering of hairs can slow transpiration and heat dissipation. Furthermore, the inflorescence of subsect. *Cymosae* has an elongate peduncle to hold the flowers high in order to gain more sunlight in low mountain habitats with dense mist, while that of subsect. *Stenosepalae* has no peduncle or has a much shortened one, usually with two leaves surrounding the dense, corymb-

like cyme so that the reproductive organs can be protected from the intrusion of fierce cold weather and strong wind in high mountains. This trait of the inflorescence is seen especially in *D. longifolia* and *D. glomeruliflora*, and their varieties living above 3000 m. A further study on the adaptative meaning of stellate hairs of *Deutzia* is certainly needed.

It is noteworthy that *Deutzia coriacea* Rehd. is a striking species from eastern Sichuan and should have been included in this paper. However, no collection from China is available and three trips by the author to the type locality have failed to find the species. Therefore, it is excluded from the paper until further collections and a detailed study can be made.

III. Key to the species

1. Petals imbricate in flower buds, broadly obovate to subcircular; calyx teeth broadly triangular-ovate to broadly ovate, much shorter than calyx tube
I. Sect. *Mesodeutzia* C.K. Schn. (1). Ser. *Rubentes* Zaikonn. 2
- 1' Petals valvate in flower buds, oblong-elliptic or obovate (II. Sect. *Deutzia*
..... 4
 2. Lower side of leaves glaucescent, glabrous or rarely very sparsely covered with 4-6 rayed stellate hairs
..... 1a. *D. hypoglauca* var. *hypoglauca*
 - 2' Lower side of leaves not glaucescent but with 3-6(-7) rayed stellate hairs 3
3. Upper side of leaves sparingly covered with 3 rayed stellate hairs, lower side densely covered with 3-5 rayed stellate hairs; flowers white
..... 1b. *D. hypoglauca* var. *shawana* (Zaikonn.) Zaikonn.
- 3' Upper side of leaves covered with 4-5 rayed stellate hairs, lower side covered with 4-7 rayed stellate hairs; flowers pink 2. *D. rubens* Rehd.
 4. Calyx teeth triangular to deltate, much shorter than calyx tube . 5
 - 4' Calyx teeth narrowly triangular to lanceolate, as long as calyx tube to slightly longer than calyx tube; cyme sessile, petals obovate
3. Subsect. *Stenosepalae* C.K. Schn. (4). Ser. *Discolores* Zaikonn.
..... 15
5. Inflorescence a panicle, sessile; filaments narrowly oblong with teeth at apex or without teeth, the teeth (if present) usually not exceeding the anther 1. Subsect. *Deutzia* 3. *D. schneideriana* Rehd.

- 5' Inflorescence a corymblike cyme with longer peduncle (rarely subsessile); teeth at apex of inner filaments usually exceeding the anther 2. Subsect. *Cyomosae* Rehd. 6
 - 6. Upper side of leaves greenish, lower side albinotic or grayish green, rather densely covered with 10-18 rayed stellate hairs; peduncle more than 3 cm long (2). Ser. *Multiradiatae* P. He 7
 - 6' Upper and lower sides of leaves greenish, sparsely to very sparsely covered with fewer rayed (those on lower side usually 4-8 rayed) stellate hairs; peduncle only 1-2 cm long (3). Ser. *Pauciradiatae* P. He 8
- 7. Lamina strongly coriaceous, lower side albinotic, stellate hairs 12-18 rayed 4. *D. multiradiata* W.T. Wang
- 7' Lamina slightly coriaceous, lower side grayish green, stellate hairs 10-12 rayed 5. *D. nitidula* W.T. Wang
 - 8. Lamina hard chartaceous to coriaceous 9
 - 8' Lamina membranous to slightly chartaceous 10
- 9. Lower side of leaves covered with 7-8 rayed stellate hairs; styles usually 3; cyme with 5-20 flowers 6. *D. fargesii* Franch.
- 9' Lower side of leaves covered with 5-6 rayed stellate hairs; styles usually 4; cyme with 3-6 flowers 7. *D. bodinieri* Rehd.
 - 10. Young twigs, peduncles and pedicels with stellate hairs, simple hairs lacking 11
 - 10' Young twigs, peduncles and pedicels with stellate hairs and also with brown, spreading simple hairs 14
- 11. Lower side of leaves covered with unstalked stellate hairs with rays appressed to leaf surface 12
- 11' Lower side of leaves covered with stellate hairs with a short stalk, rays not appressed to leaf surface 10. *D. leiboensis* P. He & L.C. Hu
 - 12. Base of lamina obtuse to rounded; cyme composed of fewer than 15 flowers 13
 - 12' Base of lamina cordate (-rounded); cyme composed of more than 30 flowers 9. *D. corymbiflora* Lem. ex André
- 13. Stellate hairs on lower side of leaves usually without central rays; outer filaments with 2 shorter teeth at apex, these not exceeding the anther 8a. *D. setchuenensis* var. *setchuenensis*

- 13' Stellate hairs on lower side of leaves usually with central rays; outer filaments with 2 longer teeth at apex, these exceeding the anther
 8b. *D. setchuenensis* var. *longidentata* Rehd.
14. Leaves dark green; outer surface of calyx tube covered with appressed stellate hairs without central ray; calyx teeth deltate, 0.8-1.2 mm long; outer filaments with 2 sicklelike teeth, far exceeding the anther; persisting calyx teeth incurved
 11a. *D. pilosa* Rehd. var. *pilosa*
- 14' Leaves yellowish green; stellate hairs on outer surface of calyx tube with or without central ray; calyx teeth narrowly triangular to triangular, 1.5-2.5 mm long; outer filaments with 2 teeth, not exceeding the anther; persisting calyx teeth straight, spreading
 11b. *D. pilosa* Rehd. var. *longiloba* P. He & L.C. Hu
15. Young twigs papillose, fertile branches much shortened; cyme bearing 2-5 flowers; lamina 1.8-2.5 cm long, 0.6-1.2 cm wide, lower side covered with 6-8(-9) rayed stellate hairs 2. *D. rehderiana* C.K. Schn.
- 15' Young twigs not papillose 16
16. Anther with a 1.0-2.5 mm long stalk 17
- 16' Anther with a stalk shorter than 1 mm 19
17. Lower side of leaves rather densely covered with stellate hairs, hairs touching one another; inner filaments with 2-3 teeth at apex 18
- 17' Lower side of leaves sparsely to densely covered with stellate hairs, hairs not touching one another; inner filaments connate to 1 tooth at apex
 15. *D. nanchuanensis* W.T. Wang
18. Lower side of leaves albinotic or albescent; cyme dense, pedicels 3-6 mm long; anthers of inner filaments attached between 2 teeth at apex 13. *D. discolor* Hemsl.
- 18' Lower side of leaves grayish green; cyme lax, pedicels 10-15 mm long; anthers of inner filaments attached to the middle part of the inner surface of the filaments 14. *D. vilmorinae* Lem. & Bois
19. Flowers red to purple 20
- 19' Flowers white 23
20. Lamina 4.5-8.0(-10) cm long, 1.0-2.5(-3.0) cm wide, lower side albescent 21

- 20' Lamina 2.0-3.0(-4.5) cm long, 0.6-1.2 cm wide, lower side grayish green, covered with 6-8 rayed stellate hairs
 7c. *D. longifolia* Franch. var. *sikangensis* (Fang) P. He
21. Lamina ovate to ovate-lanceolate, lower side sparsely covered with (6-)7-10 rayed stellate hairs, hairs not touching each other; pedicels shorter than 4 mm 16. *D. jinyangensis* P. He & L.C. Hu
- 21' Lamina lanceolate, lower side rather densely covered with 8-18 rayed stellate hairs, hairs touching each other; pedicels longer than 4 mm .22
22. Upper side of leaves sparsely covered with 5-6(-7) rayed stellate hairs, the hairs usually with central ray, lower side covered with 8-14 rayed stellate hairs, central ray present or absent
 17a. *D. longifolia* Franch. var. *longifolia*
- 22' Upper side of leaves densely covered with 6-11 rayed appressed stellate hairs, lower side covered with 13-18 rayed appressed stellate hairs without central ray
 17b. *D. longifolia* Franch. var. *densitomentosa* P. He & L.C. Hu
23. Lower side of leaves grayish green, sparsely covered with 4-6(-7) rayed stellate hairs, hairs not touching one another; outer filaments wide, petaloid 18a. *D. glomeruliflora* Franch. var. *glomeruliflora*
- 23' Lower side of leaves albescent, densely to rather densely covered with (7-)8-12(-13) rayed stellate hairs, hairs touching one another; outer filaments narrow 24
24. Lower side of leaves covered with 7-10 rayed stellate hairs, central ray present 18b. *D. glomeruliflora* Franch.
 var. *zerophyta* (Hand.-Mazz.) Zaikonn.
- 24' Lower side of leaves covered with 8-13 rayed appressed stellate hairs, central ray lacking
 18c. *D. glomeruliflora* Franch. var. *forrestiana* Zaikonn.

ACKNOWLEDGMENTS

The field work and herbarium visits were partly supported by grants from the *Flora Sichuanica* foundation and the author wishes to thank Prof. Dr. L.C. Hu, Biology Department of Sichuan University, for her unfailing encouragement and guidance to the author over the past three years. Thanks are due to Prof. Dr. Z. He and Prof. Dr. J.H. Xiong of Southwest China Agriculture University for comments on the paper.

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